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EDITORIAL

AN EPIDEMIC AND ITS LESSON

If one studies the natural history of any infective disease, no matter whether the cause be of bacterial or virus origin, one of the striking features which impinges immediately upon the mind is that such diseases are never constant in incidence, but are subject to a series of waves. There are times when the wave of incidence is high and represents an epidemic, and there are times when it is so low as to be scarcely worthy of notice. The virulence of the infecting organism also varies in due proportion, as does also the resistance of the host. The latter is probably the most important factor, for resistance and the development of immune bodies depends upon the stimulus the tissues receive. Waves of high incidence lead to high resistance, and this, in turn, to conquest. On the other hand, a low incidence has the reverse effect.

Infective diseases cannot be conquered completely except by elimination, and this has its dangers, for if a disease be eliminated from a herd or area, even for a long period of time, the probability of its return cannot be ignored. Natural resistance may be lowered to such an extent in the quiescent time that if organisms of extremely low virulence gain access great calamity may result.

Those who study the records which indicate the site of disease-infected premises in the United Kingdom must have noted that there has been a great increase in the incidence of swine fever during recent months. This news is all the more disturbing because the available knowledge of the ætiology and pathogenesis of this porcine disease stands at a very high level.

(The April issue of The British Veterinary Journal was published on April 18)

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Competent workers have devoted many years of diligent research to the problem, and as a result of their efforts the natural history of the disease has been disclosed, and, moreover, a method of prophylaxis with a high percentage efficiency in the field has been evolved.

With all this valuable knowledge to hand, and especially as crystal violet vaccine has become freely available, why is it that this sudden exacerbation in the incidence of the disease can occur? No wonder there is some dismay in the countryside when statistics show that the country is in the presence of a violent recrudescence which is gaining momentum from day to day and threatens to reach epidemic standard.

What is the lesson of the present epidemic? There is no doubt that in recent years the natural incidence of swine fever was on the wane. The new methods of prophylaxis accentuated the fall. Swine fever dropped to such a low level that many owners dismissed it from their minds. False economy led them to neglect to take advantage of the active resistance which could be stimulated by the use of prophylactic vaccine. Resistance fell to such a low level in this period of false security that, given the opportunity, the virus had an ideal field for propagation prepared by the neglect and ignorance of owners.

Pain, suffering and calamities are sore to bear, but they act as signals and guides for the future.

The present outbreak will come to an end in the ordinary process of nature; we may hasten this end by scientific aids, but the greatest benefit which can accrue will be the realisation that disease must be fought actively and constantly in all its phases.

SPECIAL CORONATION NUMBER

It has been the practice of the Editors of the *British Veterinary Journal* to mark momentous occasions in the history of the British Empire by the issue of a special number. To mark the Coronation of Queen Elizabeth II, the June issue will follow the precedence of the past.

The Editors have collected material from various parts of our great Commonwealth and Empire, and they hope to make the issue worthy of a great and memorable occasion.

GENERAL ARTICLES

HELMINTHOLOGICAL INVESTIGATIONS ON AN ARGYLLSHIRE HILL FARM

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Introduction

THIS paper describes certain helminthological observations made during the course of a general disease survey, which is being carried out on Lephinmore Hill Farm. This is a typical Argyllshire hill sheep farm, where precise knowledge of the losses from disease and other agencies was practically non-existent prior to the commencement of the survey.

Lephinmore Farm is managed by the West of Scotland Agricultural College for the Hill Farms' Research Committee and is typical of most hill sheep farms in the Western Highlands. It is situated about 20 miles from the head of Loch Fyne in the Cowal district of Argyll and carries a stock of approximately 600 Scottish Blackface ewes. The hill rises from the eastern shore of Loch Fyne to a height of 1,540 feet in a series of steep slopes and comparatively flat areas, on which there are considerable beds of deep peat. The rainfall is fairly heavy, over 60 inches per annum, and most of the peaty areas are wet. A minimum of shelter is provided by the general aspect of the slopes which is north-west or north. The hill is divided naturaly by hill burns and gullies into four "cuts," which, although differing in the quantity of vegetation, have basically the same types, consisting of coarse grasses, sedges, rushes and heather and on the lower slopes scrub birch, hazel and alder; heather burning has been neglected. Clay or heavy loam is exposed towards the sea loch; some of the lower slopes are fenced in and afforested. The hoggs are wintered away on low ground farms some 15 to 20 miles to the south.

The helminthological investigations were planned to determine the species infesting the sheep, the severity of the infestations, and the seasonal variations of the infestations and of worm egg production. Moreover, it was planned so that the results could be compared with the data from similar investigations which had been and were being carried out at Gilmanscleuch, Ettrick, in the centre of the Southern Uplands of Scotland (Morgan, Parnell and Rayski, 1950 and 1951), and particularly it was expected that a comparison of the data from two totally different hill sheep farms would help in drawing up general programmes of anthelmintic treatment.

Gilmanscleuch hill rises from about 700 to 1,800 feet above sea level; the vegetation consists largely of various hill grasses with some patches of sedges

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and rushes and some short heather (Linton, 1918). The rainfall is about 50 inches per annum.

Materials and Methods

Worm counts of Lephinmore sheep

Two draft ewes and one adult wether, chosen at random, were taken from the hill to Dunoon Slaughterhouse, where they were killed. The first three sheep were slaughtered at the end of December, 1949, and three more were killed at the end of January and of February, 1950. Thereafter, two ewes and a wether were killed at fortnightly intervals until April 5, 1951. In addition, two wether lambs/hoggs were killed fortnightly from the middle of July, 1950, until the end of June, 1951. The total number of sheep killed was 148, consisting of 64 aged draft ewes, 32 adult wethers and 52 wether lambs/hoggs.*

As the animals were killed two blood samples (citrated and non-citrated) were collected from each for analysis for the general disease survey. The abomasum and the first 16 feet of the small intestine from each sheep were cleaned of fat and put into separate glass jars containing a 5 per cent aqueous solution of glycerine. The abomasal and the intestinal contents and the mucosæ were examined by the methods described by Morgan, Parnell and Rayski (1951).

During the winter and spring of 1950 the slaughtering dates of these sheep coincided with the slaughtering dates of the two ewes from Gilmanscleuch (see Morgan, Parnell and Rayski, 1951); thus comparisons could be made between the dates of the spring increase in the worm burdens of sheep on the west coast and those of sheep in the Southern Uplands.

Worm egg counts of Lephinmore sheep

In 1950 worm egg counts were made on 30 ewe lambs at approximately fortnightly intervals from the middle of June until the middle of October. In 1951, with the exception of the periods at lambing and tupping, worm egg counts were made at fortnightly intervals on most of the sheep from the north-east and south-west "cuts" of the farm. The former carried a stock of about 200 ewes and the latter about 40 ewes. In addition the sheep of another "cut" were sampled at the end of March, early in June, in August and in November.

Fæces samples were taken from the rectum of each animal and packed into small tins, each of which had a number painted on the lid identifying it with the donor. Worm eggs were counted by the modified McMaster technique described by Morgan, Parnell and Rayski (1950).

Results

Worm Counts in Lambs/Hoggs

Abomasum

The first two wether lambs were slaughtered on July 13, 1950, when they were between 10 and 12 weeks old; the last two hoggs were slaughtered

*Although in popular terminology the "hoggs" would become "gimmers" or "clipped hoggs," and the "gimmers" would become "young ewes" during the summer, the terms hoggs and gimmers have been retained in this paper for the whole of the year 1951 for sheep born in 1950 and 1949 respectively.

on June 28, 1951, when they were about 14 months old. A very misleading impression can be given by averaging the worm counts of only two, four or even six sheep, but it has been done in this paper. Where, however, one of the sheep contributed over 90 per cent of the average number the fact has been noted in the accompanying tables with an asterisk (*) except where the numbers in the more heavily infested animal were also small.

Table 1 gives the average number of helminths recovered from the two, four or six lambs/hoggs each month. This table shows that *Ostertagia* spp. were the most prevalent worms throughout the summer and autumn, and that, although very few lambs were entirely free of *Hæmonchus contortus*, it was not until May and June, when the hoggs were just over a year old, that this parasite was found in large numbers. Similarly, *Trichostrongylus axei* was not numerous in the hoggs until June. The table also shows that more larvæ were picked up and developed in the hoggs during the winter and early spring than at any other time of the year. In this age group the over-all proportion of *Ostertagia circumcincta* to *O. trifurcata* was almost 20 to one, assuming that the females were in the same ratio as that of the males; females were about 1.6 times more numerous than males.

With the exception of three larvæ, no larva was found in the mucous lining of the abomasa before February or after May. Eighteen hoggs were slaughtered between the beginning of February and the end of May, 1951, and larvæ were found in the abomasal mucosa of 12, the average number was 35 and the highest number was 121.

Small Intestine

Trichostrongylus spp. were absent from the small intestine of the lambs until towards the end of August, after which the numbers rose gradually during the late summer and autumn. During the winter, spring and early summer,

TABLE I

SHOWING THE AVERAGE WORM COUNTS OF THE LAMBS/HOGGS EACH MONTH

	1950	1951									
	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
H. contortus	11	36	75	22	13	38	3	2	1	159	1,608	1,403
Ostertagia spp.	75	438	938	162	212	308	75	100	188	475	758	888
T. axei	12	0	100	0	12	83	50	12	88	175	108	850
Larval stages in abomasa	0	138*	100	25	0	67	438	550	500	1,175	233	100
Trichostrongylus spp. ...	0	38	388	100	350	625	812	412	1,750	900	725	1,438
C. curticei	0	0	25	25	0	17	162	0	88	12	33	0
B. trigonocephalum ...	1	5	30	44	80	142	145	334	50	78	165	365
Nematodirus spp. ...	62	50	100	100	188	1,017	650	275	62	112*	275	225
Larval stages in small intestines	0	0	38	12	25	0	50	62	150	100	25	50
S. papillosus	0	38	38	50	25	25	0	38	25	0	0	0
Œ venulosum	0	1	16	7	20	7	7	27	119	84	225	86
C. ovina	1	1	1	2	3	5	4	8	20	14	47	16
T. ovis	1	3	2	1	1	3	5	2	2	1	3	2

*More than 90 per cent of the average count was from one hogg.

some of the hoggs carried infestations which may have adversely affected their health. The ratio of *Trichostrongylus colubriformis* to *T. vitrinus* was almost 1 to 3.7 and the ratio of males to females was 1 to 1.9.

The first *Bunostomum trigonocephalum* was found in a lamb at the end of July, and the infestations became progressively heavier towards autumn and winter. They were maintained at a much higher level than those found by Morgan, Parnell and Rayski (1951) in Ettrick. After August only one hogg was found to be free of this hookworm; the highest individual count was 1,066; the sex ratio of this parasite was one male to 1.15 females.

Nematodirus spp. were not numerous, but were slightly heavier in the winter. Similarly, infestations with *Cooperia curticei* and *Strongyloides papillosus* were light.

Immature stages of helminths were found in the lumen of the small intestine of about one-third of the hoggs after September, but the infestations were always light; 500 was the highest count. Larvæ were not found in the mucosa of the small intestine of any of the lambs or hoggs.

Large Intestine

The first *Chabertia ovina* was found at the end of July, but it was not until the end of the following March that there was any marked increase in numbers.

One *Œsophagostomum venulosum* was found in a lamb early in August. In the autumn and early winter this species was rather more numerous than *Chabertia ovina,* and the increase during spring was earlier and greater.

Trichuris ovis was never very prevalent, the highest individual count being 10 in a hogg killed in January.

Other Helminths

During the examination of the carcases at the slaughterhouse and while the worm counts were being carried out notes were made of the presence or absence of several parasites not mentioned in Tables 1 to 3. These occurred as follows:—

Moniezia spp. Tapeworms were found in most of the lambs/hoggs from July until the end of the year, but in the winter only about one-third of the hoggs were infested and the infestations were light. The heaviest infestations occurred at the end of August and the beginning of September.

Capillaria spp. were found occasionally.

Lungworms. Dictyocaulus filaria was not found, but practically all the animals had light infestations of *Muellerius capillaris.*

Fasciola hepatica. The first infestation with liver fluke occurred in one of the hoggs killed on October 5, and subsequently infestations were found in 24 per cent of the hoggs.

Cysticercus tenuicollis. These cysts were found in 11 of the lambs/hoggs; the first cyst was recovered from a seven-month-old hogg in November.

TABLE II
THE AVERAGE WORM COUNTS OF THE EWES EACH MONTH

	1949 Dec.	1950 Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	1951 Jan.	Feb.	Mar.	Apr.
H. contortus	0	0	0	0	6	605*	1	332	48	280*	1	0	18*	9*	0	3	0
Ostertagia spp.	0	0	100	88	1,325	1,658*	212	688*	288	550	50	63	417*	25	0	63	125
T. axei	0	75	100	125	25	192	38	25	238	75	63	0	42	0	0	12	200*
Larval stages in abomasa	250	50	225	4,438	6,038	2,450	88	13	562	88	75	0	92	150	25	63	63
Trichostrongylus spp.	50	0	0	0	0	200	300*	200	213	1,938	0	350	250	275*	0	0	1,600
C. curticei	100	25	100	213	225*	17	63	113	100	63	100	13	125	113	0	50	125
B. trigonocephalum	15	24*	3	22	5	7	7	22	18	18	3	11	24	24	17	10	22
Nematodirus spp.	0	0	0	0	0	0	0	63	13	263*	0	38	8	350*	0	0	50
Larval stages in small intestines	0	0	0	38	63	100*	0	0	0	25	0	25	25	50	0	0	500*
S. papillosus	0	0	0	25	0	13	0	13	13	0	0	0	0	13	13	0	0
Œ venulosum	0	0	0	0	0	1	8*	12	2	2	0	4	2	1	0	0	18*
C. ovina	1	1	0	1	0	26	0	23*	3	11	1	5	5	3	1	6	14*
T. ovis	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0

* More than 90 per cent of the average count was from one ewe.

TABLE III
THE AVERAGE WORM COUNTS OF THE WETHERS EACH MONTH

	1949 Dec.	1950 Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	1951 Jan.	Feb.	Mar.	Apr.
H. contortus	0	0	0	0	46	20	5	66	0	1	0	0	0	0	0	0	0
Ostertagia spp.	0	50	0	0	725	1,450	100	250*	0	375	200	200	17	0	0	350	0
T. axei.	250	400	300	225	625	417	0	250	200	125	25	0	50	25	25	175*	0
Larval stages in abomasa.	0	600	250	775*	250	1,317	0	0	25	100	25	0	83	50	25	500*	0
Trichostrongylus spp.	0	100	50	25	0	267	25	125	50	0	0	225	50	0	0	150	0
C. curticei	0	0	0	0	0	17	0	0	0	25	0	25	33	50	0	50	0
B. trigonocephalum	7	25	89	17	72	2	13	35	31	36	8	35	5	10	24	23	9
Nematodirus spp.	0	0	0	0	0	0	0	0	0	0	25	350	33	25	0	50	0
Larval stages in small intestines	0	50	0	150	0	17	0	25	0	0	0	0	0	25	0	50	0
S. papillosus	0	0	0	25	25	0	25	0	0	0	0	50	0	50	25	0	0
Œ venulosum	0	0	0	0	0	0	0	0	11	1	1	8	1	1	0	17*	0
C. ovina	0	0	0	0	2	1	0	0	20	1	0	19	1	2	1	4	0
T. ovis.	0	0	0	1	0	0	0	0	5	0	0	5	1	1	0	0	0

* More than 90 per cent of the average count was from one wether.

Worm Counts in Ewes and Wethers

Table 2 shows the average number of helminths recovered from the two, four or six ewes each month, and Table 3 the average numbers recovered from the wethers.

Abomasum

Seventy-two of the 96 adult sheep slaughtered were free of *Hæmonchus contortus*. In 12 others the infestations were only 20 or less; five more carried infestations of between 30 and 60 and three others infestations of between 110 and 150. One ewe slaughtered early in May carried 3,620 *H. contortus* and over 20 per cent of the 12,400 young stages in the abomasum were *H. contortus*. Two ewes slaughtered on July 13 and 27 carried 1,014 and 313 *H. contortus* respectively, while 1,120 were recovered from another ewe slaughtered on September 7.

In the ewes and wethers the over-all incidence of male *Ostertagia circumcincta* to male *O. trifurcata* was just over six to one, but varied, of course, from sheep to sheep. The incidence of males to females was 1 to 1.5. Most of these adult sheep were infested with *Ostertagia* spp. and *T. axei;* the infestations tended to be heaviest in the spring and summer; a few of these sheep had fairly heavy *Ostertagia* spp. infestations.

The numbers of larval stages in both ewes and wethers tended to increase and decrease at approximately the same dates, but generally there were fewer in the wethers. The marked decrease occurred towards the end of May. Furthermore, comparatively few developing young stages were found in either the abomasa or small intestines of the wethers between the end of May and the beginning of December. In 1951 the rapid rise in numbers started later than in 1950.

The mucous membranes of the abomasa and small intestines were examined for encysted or migrating larvæ; from one to 13 larvæ were found in the abomasal mucosa of five sheep, all in March, April and May. Only one larva was found in the mucosa of the small intestine.

Small Intestine

The incidence of *T. colubriformis* males to *T. vitrinus* males was 1 to 6.4, and of males to females 1 to 2.2. Tables 2 and 3 show that in winter and early spring usually only a few *Trichostrongylus* spp. were found in these adult sheep. During the rest of the year the infestations of *Trichostrongylus* spp. in the ewes were nearly three times as heavy as those in the wethers.

A few *Cooperia curticei* were found throughout the year; the average numbers in the ewes were over five times greater than in the wethers.

Nematodirus spp. were found in 15 of the ewes and wethers; most of them during the summer and autumn; 1,400 was the highest individual number.

Unlike *Trichostrongylus* spp. and *C. curticei* the average numbers of *Bunostomum trigonocephalum* in these wethers was about one-and-a-half times

greater than in the ewes. This species was not found in 15 of the ewes and wethers; 89 was the highest number recovered. The sex ratio was 1 to 1.45.

The infestations of *Strongyloides papillosus* were, without exception, very light.

Large Intestine

Infestations of *Œsophagostomum venulosum* and *Chabertia ovina* were never heavy. The former was absent in 46 ewes and 23 wethers, while the latter was absent in 30 ewes and 19 wethers. The heaviest infestations were 36 *O. venulosum* and 84 *C. ovina,* both in ewes.

Trichuris ovis was found in eight sheep, nine worms was the heaviest infestation.

Other Helminths

Moniezia spp. About one-third of the ewes and wethers were infested with these tapeworms; the incidence in the ewes was about double that in the wethers.

Capillaria spp. Light infestations of *Capillaria* spp. were found in five ewes.

Lungworms. Dictyocaulus filaria was not found, but most of the ewes and wethers were infested with *Muellerius capillaris,* several of them heavily.

Fasciola hepatica. Half of the ewes and wethers were infested with liver fluke.

Cysticercus tenuicollis. These cysts were recovered in varying numbers in 14, or nearly 22 per cent, of the ewes and in 11, or over 34 per cent of the wethers.

Worm Egg Counts

Lambs

Until the middle of July, 1950, the worm egg counts of the lambs were low, but by the end of July they averaged 96 eggs per gramme of "Other Strongyles,"* and the number of Strongyloides eggs had increased to 26 eggs per gramme. On August 10, Nematodirus eggs reached their peak at 15 eggs per gramme. On August 24 the "Other Strongyle" egg count averaged 194, while at both September samplings the average counts were about 350 eggs per gramme; the number of *Strongyloides papillosus* eggs reached its peak—37 eggs per gramme—early in September. By the time these hoggs went to wintering, in the middle of October, the counts had risen to 545 "Other Strongyle" eggs per gramme, with 100 eggs per gramme the lowest individual count.

In June practically all the larvæ cultured from the lamb fæces were those of *Ostertagia* spp., but by mid-July about a third were *Hæmonchus contortus.* Early in August larvæ of *Ostertagia* spp. still predominated and about 15 per

* In this paper 'Other Strongyles" include all the Strongyle eggs found in these sheep, with the exception of *Nematodirus* spp.

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cent were those of *Trichostrongylus spp.* By mid-October about a third were those of *Trichostrongylus* spp. and another third were still those of *H. contortus.*

In 1951 the pattern of the "Other Strongyle" egg counts of the lambs on the north-east cut was again unlike that of the lambs on most Scottish hills, as shown in Graph I of Morgan, Parnell and Rayski (1951). In July the average "Other Strongyle" egg counts were slightly lower than in 1950, but were higher in August and September. By the beginning of October they had fallen to counts similar to those of 1950.

The counts of *S. Papillosus* and *Nematodirus spp.* were even lower than in 1950 and together never averaged more than 10 eggs per gramme.

Worm egg counts in hoggs and older sheep

Graph I shows the combined Strongyloides, Nematodirus and "Other Strongyle" egg counts for the hoggs, gimmers and ewes from the north-east cut in 1951 and the same data for the other sheep in the spring, summer and autumn.*

Some of the hoggs, which were wintered away in 1950-51, were used for dosing experiments; only the undosed controls are considered in this paper.

Since fæces samples were not collected between the beginning of April and the end of May, a period of six or seven weeks, because of lambing, this graph may give a somewhat misleading picture of the exact date when the spring rise in worm egg output occurred.

Graph I shows that it was only at the end of March or the beginning of April that the worm egg counts of the adult sheep started to increase, and that by the middle of August there were comparatively few with high counts; the proportion with high counts was greater in the younger ages.

In most hill districts of Scotland *H. contortus* is not prevalent, on Lephinmore, however, the young sheep frequently harbour this helminth. Where this prolific egg layer is not common a worm egg count of 1,000 eggs per gramme indicates a fairly heavy infestation for a hill sheep.

Discussion

The data shows that the sheep on Lephinmore harbour the usual nematodes found in British sheep and that, in general, the rise and fall of the incidence of the various species throughout the year coincides with the observations of Morgan, Parnell and Rayski (1951).

While the incidence of *H. contortus* was very erratic this parasite did occur at times in numbers sufficient to cause clinical symptoms. Three of the ewes carried infestations of over 1,000, the highest individual count being 3,619. The

* Owing to weather conditions, particularly mists, and the rough ground, it is seldom possible to have a clean gathering at Lephinmore, consequently the numbers of sheep sampled varied from gathering to gathering and, of course, there were always a few from which fæces samples could not be obtained. However, it is probably correct to consider the counts as random samples.

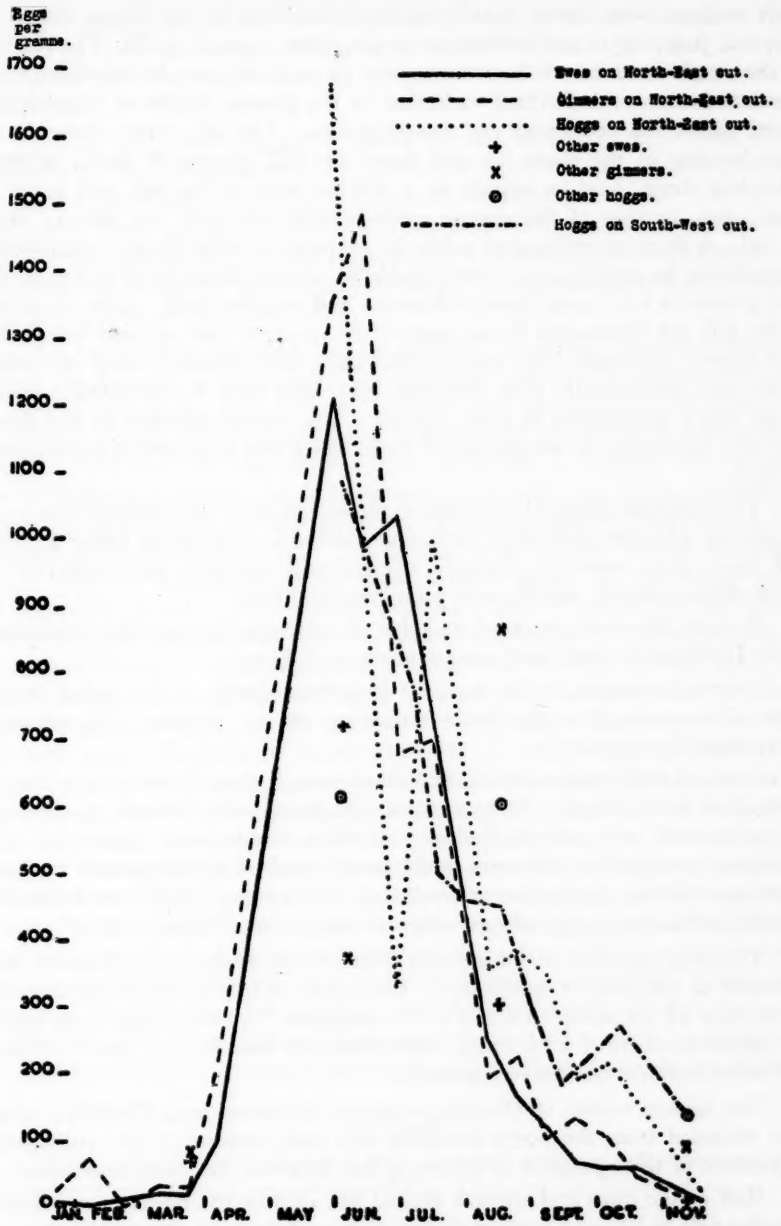

FIG. 1

A graph which shows the average worm-egg counts of the Lephinmore sheep in 1950.

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adult wethers were never heavily infested, but five of the hoggs killed in May and June, 1951, had infestations ranging from 1,314 to 5,088. The reasons for the erratic incidence of *H. contortus* are obscure, but may be associated with genetical factors or individual variations in the grazing habits of Scottish hill sheep, which are comparatively non-gregarious. On hills where there is no daily herding of the sheep up and down the hill, groups of sheep, or even individual sheep, tend to remain on a definite area on the hill, and some of these areas, because of the sweeter grass growing on them, are heavily overstocked. A sheep carrying even a few *H. contortus* or other bursate nematodes, by confining its grazing to an area suitable for the development of larvæ, might soon produce a very heavy larval infestation and re-infest itself. After wintering on the hill, the infestations in the hoggs of *H. contortus* and of other helminths, were heavy. Normally, the hoggs would have been wintered away on arable farms, and consequently poor nutrition may have been a contributing factor to the heavy infestations in these animals. The nutritional state of hill sheep is wholly dependent on the growth of grass, which was very late at Lephinmore in 1951.

The numbers required to produce severe symptoms of hæmonchosis must depend on a variety of factors, including nutrition. The hoggs killed in May and June, 1951, were all clinically affected with parasitic gastro-enteritis in which severe anæmia was the most prominent symptom.

It must, therefore, be concluded that *H. contortus* can become established in the Lephinmore sheep and cause symptoms of disease.

Ostertagia appears to be the most important species in the spring in the ewes; *Trichostrongylus* spp. were numerous during autumn and persisted throughout the winter.

Comparatively large numbers of *Bunostomum trigonocephalum* were found, particularly in the hoggs. Forty-seven of these hoggs were infested, the average infestation was 126 and the highest individual counts were 1,066 and 932. Literature contains few references to the actual numbers of this parasite required to produce disease under natural conditions. Haberman (1946) stated that the number harboured by an infested sheep is usually surprisingly small.

The large numbers of hookworms found in the hoggs at Lephinmore are, therefore, of the greatest significance. One of us (A.L.W.), had an opportunity to examine all the sheep clinically before slaughter; the two hoggs from which the largest numbers of hookworms were recovered were in very poor condition and showed symptoms of severe anæmia.

The highest counts of *Œsophagostomum venulosum* and *Chabertia ovina* were obtained from the hoggs in spring and early summer. The pathogenic importance of these parasites in hill sheep has, however, not been determined.

Half of the ewes and wethers and 24 per cent of the hoggs were infested with *Fasciola hepatica* in varying degree. Some of the ewes showed the classical symptoms of heavy fluke infestation consisting of anæmia, emaciation, and submandibular dropsy.

The egg counts carried out on the Lephinmore sheep show that there is an increase in worm egg output during the spring. This is very evident in Graph I and agrees with the observations of Morgan, Parnell and Rayski (1951) made in Ettrick.

Perhaps the most important aspect of this investigation is that, while Lephinmore and Gilmansleuch are hill farms of two totally different types, the same general helminthological picture was obtained from each. The spring rise started about the same time and this was due mainly to *Ostertagia* spp. and to a certain extent by *Trichostrongylus* spp. However, at Lephinmore *H. contortus* and *B. trigonocephalum* both showed a higher incidence and heavier infestations than at Gilmanscleuch.

The similarity in the occurrence of the date of the spring rise should simplify greatly the drawing up of general programmes of routine anthelmintic treatment for Scottish hill sheep. Unfortunately, it is not until late March or the beginning of April that these larvæ are sufficiently mature to be vulnerable to most anthelmintics. This fact, together with the data on Graph I, suggests that the ewes should perhaps be treated with an anthelmintic while the spring increase in worm infestations and the rise in worm egg output is occurring, i.e., a few days before the start of lambing. This dosing, however, must be with an anthelmintic which is completely safe for in-lamb ewes, should kill the young stages of nematodes as well as adults, and must be effective against all the species which are pathogenically important in Scottish hill sheep. It could be given at the "udder locking," when farmers pluck the wool from the udders, mark the barren ewes, inoculate and/or dip them. Graph I also indicates that the worm egg output of the hoggs on the north-east cut, like those on many other hills, was very high. Hoggs could be treated with an anthelmintic on their return from wintering at the beginning of April. These treatments of the in-lamb ewes and of hoggs should reduce worm egg output and thus the larval contamination of the grazings. Since *Bunostomum trigonocephalum* may be found in large numbers during winter, treatment for this species can probably be combined with treatment for the control of liver fluke with carbon tetrachloride, provided that sufficiently large doses are used. Further work is being undertaken to determine the effect of these treatments on the subsequent worm egg output, and this knowledge must be obtained before strategic anthelmintic dosing programmes can be recommended. These data have also confirmed that the worm burdens in young sheep tend to be heavier than in older sheep, and that the infestations with some species are lighter in adult wethers than they are in ewes.

Summary

(1) The worm counts obtained from 64 aged ewes, 32 adult wethers and 52 wether lambs from a typical Argyllshire hill farm are described.

(2) Worm egg counts were carried out and are presented in the form of a graph.

(3) The very important point has been confirmed that, in general, the

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infestations of the west coast of Scotland have a very similar pattern to those in sheep on the Southern Uplands, where the climatic and grazing conditions are very different.

(4) *Ostertagia* spp., *Trichostrongylus* spp. and *Bunostomum trigonocephalum* are important in Scottish hill sheep. *Hæmonchus contortus* may, at times, occur in large numbers.

Acknowledgments

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FIELD TRIALS WITH A SHEEP DIP CONTAINING D.D.T. AND BENZENE HEXACHLORIDE IN MICRO-CRYSTALLINE FORM

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Introduction

THE value of dips containing dichlorodiphenyltrichlorethane (D.D.T.) in protecting sheep against oviposition by *Lucilia sericata* Meigen and other blowflies has been demonstrated in trials made in Great Britain by Cragg (1945, 1946),

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PLATE I

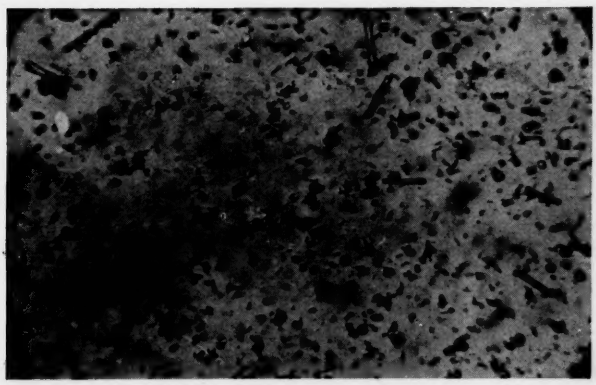

FIG. 1
Microcrystalline B.H.C.-D.D.T. dip. Magnification x 350.

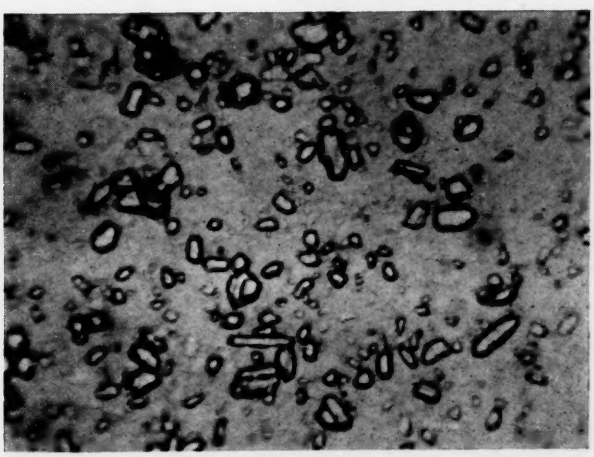

FIG. 2
Suspension B.H.C.-D.D.T. dip. Magnification x 350.

(*Article by Worden and Jackson, page* 190)

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Hughes, Jenkins and Jones (1946), and Hughes, Pollard, Field and Jones (1947), in Australia by Shanahan (1948, 1951 *a*, *b*), Waterhouse and Scott (1950), Roberts and Moule (1951) and Johnstone and Scott (1951), and in South Africa by Du Toit and Goosen (1949).

Hughes and his colleagues found that dips containing a dispersable preparation of D.D.T., although not affording protection against "tail strikes" or "crutch strikes" in sheep whose fleeces were contaminated with fæcal material because of scouring, nevertheless reduced the incidence of strikes in other animals to almost negligible proportions over several weeks. The trials reported in 1947, involved three groups each of approximately 1,000 sheep, and in the period of 33 days after dipping there was a strike rate of 0.5 per cent in the D.D.T. group, compared with 6.6 per cent in a group treated with benzene hexachloride (B.H.C.) and 8.1 per cent in the group treated with an arsenical dip. Further evidence of the efficiency of D.D.T. has been obtained from experiments in which sheep have been exposed to a dense artificially-bred population of ovigerous flies (Stones, 1951; see also Downing, Harbour and Stones, 1952).

Although B.H.C. has been found to be less effective than D.D.T. in protecting sheep against blow-fly attack, it is of greater value against the parasite of psoroptic mange, or "sheep scab" and is recognised for statutory purposes as an active constituent of "approved dips." The wide range of action of the two insecticides has resulted in their inclusion in dips that are approved for compulsory dipping against sheep scab, and are of value in protecting against blow-fly strikes; they have the great advantage over arsenical and other dips in being relatively non-toxic. Cases of alleged intoxication after dipping with preparations containing D.D.T. or B.H.C. have been traced to the solvent and not to the active ingredients.

Recently D.D.T. has been incorporated in sprays and dips in the form of micro-crystalline pastes. The properties of these pastes have been reviewed by Emery (1951), and in the case of plant pests, the micro-crystalline form is more toxic to insects than the amorphous form and has a greater duration of action. Most suspension dips are made by grinding D.D.T. and B.H.C. with kaolin and an emulsifier, to an extremely fine state of sub-division. In work with Emery and his colleagues dips have been made by heating D.D.T. and B.H.C. with a lignin sulphonic acid emulsifying agent until molten, and pouring into water under controlled conditions of temperature and agitation. This produces micro-crystals of D.D.T. and B.H.C., and the dip when suitably diluted shows a marked stability so far as sedimentation of the particles is concerned. The diluted dip, prepared in this fashion, contains long needle-shaped micro-crystals of D.D.T. in contrast to the D.D.T. particles—which are the broken fragments of much larger crystals—of the usual suspension dips.

Dipping Trials

During the summer of 1951 the value of a dip prepared in the above way was tested in a series of trials with flocks of sheep in Kent, Northampton and

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Somerset. A preliminary report has been published (Worden and Jackson, 1952). The formula was—

	% w/w
D.D.T.	40.0
B.H.C. (*gamma* isomer)	2.6
B.H.C. (other isomers)	0.1
Sulphite lye emulsifier	18.6
Kaolin	2.7
Water	36.0

Traces of sodium pentachlorphenate were included to prevent mould growth. The mixture was diluted at the rate of 5 lb. per 100 gallons of water and this provided a concentration of 0.013 per cent *gamma*-B.H.C. and 0.20 per cent D.D.T. Copper sulphate was added to give a concentration of 0.03 per cent in order to protect sheep against *Erysipelothrix rhusiopathiæ* and other infectious agents sometimes transmitted at dipping time.

A total of over 5,000 ewes and lambs was selected but as one farmer failed to keep proper records the report is based upon 4,521 animals.

On four of the farms, involving 1,560 sheep, the animals were sprayed during the early summer with a suitable dilution of the above formulation. These and other animals in the experiment, were dipped at some time after June 18. On three farms, involving 930 sheep, a second dipping was carried out during August. The records are summarised and unless otherwise stated, the term " period of observation " means the 42 days during which accurate records were kept. On some farms a proportion of the flock was not dipped until late in the period and in view of the findings of Hughes *et al.* (1947) it is preferable to refer to these as " undipped sheep " rather than as " controls."

Farm A, Kent—1,500 sheep were dipped on August 1, and there were no strikes apart from a single isolated " tail fly." Moreover, there were no strikes among approximately 100 undipped sheep. These undipped animals were not run separately from the main flock, and it is possible that they may have been protected through contact, as in those observed by Hughes and his colleagues. Later in the month the lambs were transferred from the Romney Marsh to another farm where they were under continuous observation until October 20. Although this new area was well wooded the farmer reported that the lambs had never been less attacked by flies, although usually during late August and September his lambs suffered continually from strikes. He did not keep detailed records during this latter period, but it appears that the degree of protection was outstanding.

Farm B, Kent—600 animals were sprayed on May 17, and between that date and June 22, 13 tail strikes and one body strike in adult sheep and 10 tail strikes in lambs were recorded. The lambs had been scouring badly, and this doubtless contributed to the incidence of tail strikes. The flock was dipped

on July 31, and after this no strikes of any kind were reported. The farmer fell ill and detailed records were not kept, but subsequently it was established that there were two strikes, one in a lamb and one in a ewe, about 40 days after dipping.

Farm C, Kent—120 animals were sprayed on May 19, and between then and dipping for the first time on July 11, six tail strikes were reported; scouring was a contributory factor. There were some slight tail strikes in a few dirty lambs after July 11. The flock was re-dipped on August 22, and during the subsequent period of observation again remained free from body strikes. There were a few minor cases of tail strike in dirty lambs and several cases of body strike in undipped ewes running with the dipped animals.

Farm D, Kent—700 animals were sprayed on May 18, and no strikes were reported for about five weeks, after which six strikes occurred. A single dipping was carried out on July 11, and during the period of observation there were four body strikes in ewes and one in a lamb.

Farm E, Northampton—520 animals were dipped on June 21; no strikes of any kind were reported.

Farm F, Northampton—150 animals were dipped on June 19, and during the period of observation there were two body strikes in ewes and two tail strikes in lambs.

Farm G, Northampton—90 animals were dipped on June 18 and one tail strike was recorded nine days later; this was the only case during the observation period. An isolated case of head and body strike occurred on the 57th day (August 13), the day before the second dipping, which conferred complete protection.

Farm H, Somerset—451 sheep, representing small contingents of 115, 33, 60, 96, 45 and 102, from six different farms, were dipped on August 1. Among the first batch of 115 sheep there was protection for 14 days only, after which 25 strikes were reported. These animals were the first to be put through the bath and the reason for the relatively poor results obtained has not been ascertained. The remaining 336 sheep remained free from body strike, and only a few minor tail strikes were reported.

Farm I, Somerset—140 sheep were sprayed on June 29, and a single tail strike occurred between then and August 29, when dipping was carried out; four body strikes were reported. After dipping three body strikes occurred during the period of observation.

Farm J, Somerset—250 animals were dipped on August 7 and the animals remained free during the period of observation; an isolated strike occurred in a ewe during October, over 60 days after dipping.

The records of these 10 centres are summarised—minor tail strikes in dirty lambs have been disregarded:—

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Farm	No. of sheep dipped	First strike (days after dipping)	Percentage struck within 42 days of dipping
A	1,500	56	*nil*
B	600	40	0.17
C	120	—	*nil*
D	700	35	0.71
E	520	—	*nil*
F	150	42	1.34
G	90	57	*nil*
H	451	14	5.56
I	140	31	2.15
J	250	60	*nil*

The results at Farm H have been commented upon.

Dipping Bath Concentrations of D.D.T. and B.H.C.

Samples taken from five of the 10 dipping baths were examined for D.D.T. and B.H.C. concentration by a modified method of that proposed by Robins (1952). Preliminary solvent extraction was not done, but the sample was centrifuged and the deposit extracted with acetone. The acetone-soluble material from 20 ml. of the sample was hydrolysed with an alcoholic solution of potassium hydroxide and the chloride formed was determined by the Volhard method. The acetone-soluble material from a further 20 ml. of the sample was subjected to the Stepanov reduction, employing sodium and *iso*-propyl alcohol, and the chloride again determined by the Volhard method.

The theoretical basis of the method adopted is as follows. The *p p* D.D.T. molecule contains five atoms of chlorine, of which one atom is lost by hydrolysis with a boiling alcoholic solution of potassium hydroxide. The B.H.C. molecule loses three of its six chlorine atoms under these conditions. The Stepanov reduction splits off all five chlorine atoms from D.D.T. and all six chlorine atoms from B.H.C. If in any mixture of the two insecticides there be D mg. of D.D.T. and B mg. of B.H.C., and the number of mg. of chlorine released as chlorine ions by the action of the dilute alcoholic solution of potassium hydroxide be Cl_H mg., then:—

$$\frac{D}{354.3} + \frac{3B}{290.8} = \frac{Cl_H}{35.5}$$

Similarly, for the same mixture, if the total amount of chlorine present be Cl_T mg., then:—

$$\frac{5D}{354.3} + \frac{6B}{290.8} = \frac{Cl_T}{35.5}$$

Solving simultaneously, we have:

$$D = 3.32 \ (Cl_T - 2\ Cl_H),$$
$$\text{and } B = 0.912 \ (5\ Cl_H - Cl_T).$$

Substitution of the experimentally-determined values of Cl_H and Cl_T gives directly the values of D and B, in mg., in the volume of dip selected. In the following table the values of D and B are expressed as w/v percentages of the actual sample of dip. The theoretical strength of dip initially present in each case was 0.20 per cent D.D.T. and 0.013 per cent *gamma* B.H.C.

Farm	Date		Sample	D.D.T %	B.H.C. %	Remarks
A	1.8.51	(i)	After 100 sheep	0.14	0.014	
		(ii)	„ 300 „	0.12	0.005	B.H.C. concentrations better than D.D.T.
		(iii)	„ 800 „	0.08	0.005	
		(iv)	„ 1,200 „	0.08	0.030	
		(v)	„ 1,500 „	0.083	0.037	
B	31.7.51	(i)	After 60 sheep	0.06	0.007	Fair
		(ii)	„ 150 „	0.125	0.005	Very dirty bath
		(iii)	„ 280 „	0.10	0.005	B.H.C. low
		(iv)	„ 350 „	0.175	0.003	
D	11.7.51	(i)	Before dipping ...	0.229	0.005	Satisfactory
		(ii)	Replenishment after 60 sheep ...	0.200	0.010	
		(iii)	After 130 sheep ...	0.143	0.009	
		(iv)	Second replenishment after 130 sheep	0.217	—	
		(v)	After 700 sheep ...	0.140	0.055	
E	21.6.21	(i)	After 130 sheep ...	0.055	0.045	B.H.C. concentrations better than D.D.T.
		(ii)	Replenishment after 200 sheep	0.041	0.056	
		(iii)	After 360 sheep ...	0.108	0.056	
F	19.6.51	(i)	After 60 sheep ...	0.106	0.022	
		(ii)	Replenishment after 150 sheep	0.076	0.025	

Discussion

The results of the dipping trials indicate that a dip containing D.D.T. and B.H.C. in micro-crystalline form is equal in efficiency to the successful suspension dips already employed in Great Britain and elsewhere for protection against blow-fly strikes and for coincident compliance with the provisions of the Sheep Scab (Amendment) Order of 1948. Such dips, which have the virtue of relatively low toxicity—provided the solvent materials employed are safe in use—are effective also against sheep keds (*Melophagus ovinus*, L.) and sheep ticks (*Ixodes ricinus*, L.), provided that commensurate steps in management are taken (Heath, 1945, 1946 *a, b;* Heath, Blaxter and Mitchell, 1946; Evans, 1950).

The relatively uncontrolled observations in these and many sheep dipping trials are open to criticism, but effective control measures are difficult to institute.

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Undipped sheep running with the same flock do not constitute controls in the strict sense, for D.D.T. persisting on the fleece of dipped sheep appears to confer some degree of protection on the undipped animals. Johnstone and Scott (1950) have suggested that, for the purposes of controlled trials, untreated sheep should be run with, and also away from, treated sheep. Stones (1951) substituted artificial exposure of treated sheep for trials in the field. This protective action seems to have been operative on those farms on which a proportion of the flock was left undipped, although on Farm C there were several cases of body strike in undipped ewes but none among the dipped animals.

A dip containing D.D.T. and B.H.C. in micro-crystalline form possesses several practical advantages. The volume of the undiluted dip required to produce a given quantity of wash containing effective concentration of D.D.T. and B.H.C. is 50 per cent in weight and volume of a comparable suspension dip. The stability of the diluted dip or wash we have employed is much greater than that of a comparable suspension dip, the rates of sedimentation being comparable with those described by Emery (1951). The physical properties of the dip containing micro-crystalline dip make it highly suitable for spraying, either by hand or by mechanically-operated plant. Furthermore, there is no solvent or other ingredient likely to prove toxic.

The physico-chemical basis of the application of insecticides to sheep fleece has recently received extensive study from Addison and Furmidge (1952 *a, b, c*) and *in vitro* tests on D.D.T., B.H.C. and other insecticides have been made by Du Toit and Fiedler (1952) who have kindly forwarded us their data before publication. We cannot give any data to suggest that the micro-crystalline forms of D.D.T. and B.H.C. are intrinsically more effective against blow-fly larvæ than the fragments of larger crystals, although by analogy with the work on other pests (Emery, 1951) such is not improbable. The economic and practical advantages of a dip of the kind formulated by us would be sufficient to justify its use if its efficacy against blow-fly strikes were similar to those of a comparable suspension dip. From the results reported in this paper and from report obtained over a wide area of Great Britain during the dipping season of 1952, we have every reason to suppose that the efficacy is at least equal to that of D.D.T.-B.H.C. suspension dips.

On the basis of the results given in this paper and of developmental work in the laboratory, we have amended the formulation adopted in the 1951 field trials to the following:—

	% w/w
D.D.T.	40.0
B.H.C. (*Gamma* isomer)	3.2
B.H.C. (Other isomers)	0.1
Sulphite lye emulsifier ...	18.6
Kaolin	3.3
Water	34.8

This has been employed successfully under different conditions during 1952 and

gives a dip with a sp. gr. of 1.210 compared with 1.340 of the dip employed during 1951.

Sodium pentachlorphenate, which was added in traces to prevent contamination by moulds, is also antibacterial. In tests with various strains of *Erysipelothrix rhusiopathiæ* we have found it to be bacteriostatic, but the results to date do not suggest that it may be relied upon entirely, in the trace concentration adopted, to replace copper sulphate. Not all cases of "post-dipping lameness" and similar troubles are attributable to *E. rhusiopathiæ* infection; other bacteria may be present, at least under Australian conditions (Montgomerie, 1952).

The incorporation of such a relatively high percentage of the *gamma* isomer of B.H.C. should be made known. Already one official analyst, who had not been made aware of the existence of such a dip, has obtained inaccurate results through his belief that he was estimating a cruder form of B.H.C. It is necessary to have 0.10 per cent of crude B.H.C. in a dipping bath at the beginning, and the concentration should not fall below 0.05 per cent. Corresponding figures for pure gamma-B.H.C. are only 0.013 per cent and 0.0065 per cent, but in the light of experience the Ministry of Agriculture and Fisheries now insists upon 0.016 per cent at the commencement, although 0.007 per cent is still an effective concentration.

Summary

(1) Sheep dips containing both D.D.T. and B.H.C. in micro-crystalline form possess considerable advantages over comparable suspension dips. Less is required to produce the same effective volume of wash, and there is a greater degree of stability of the rsultant wash, and an absence of solvent materials. The toxicity hazard is therefore negligible.

(2) Field trials made in 1951 showed that a dip formulated in the above way was highly effective in protecting sheep against blow-fly strikes. The numbers of sheep dipped and the percentage struck within 42 days thereafter at 10 different centres in three counties were, respectively: (A) 1,500—nil; (B) 600—0.17 per cent; (C) 120—nil; (D) 700—0.71 per cent; (E) 520—nil; (F) 150—1.34 per cent; (G) 90—nil; (H) 451—5.56 per cent; (I) 140—2.15 per cent; and (J) 250—nil. Effective bath concentrations of D.D.T. and B.H.C. were maintained.

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BULL-FIGHTING IN PORTUGAL

By DR. JOSÉ CALDEIRA AREIAS

Setubel, Portugal.

AFTER residing for some months in England, I realised that my English friends, learning that the bull is not killed in a Portuguese bull-fight, were curious to know more about the matter. I realised, also, that as my friends had never seen a bull-fight of any kind, they were confused with regard to the technical details.

With this in mind, I decided to write this little note, although I lay no claim to be considered a "toureiro," "ganadeiro," or an expert critic.

The bull-fight, or "corrida de touros," in Portugal may be considered to be a manifestation of art and virility. All kinds of skilful manœuvres or "sortes" are executed with the object of giving the spectator a colourful and vivid spectacle of man's defeat of the wild beast and his triumph over the strength of the bull by the use of intelligence, bravery and skill.

Bull-fights originated in Portugal hundreds of years ago as a result of the permanent contact between man and the bull of the Peninsular wild breed called "raça brava." These bulls were used in the hard work connected with the cultivating of the rice fields, therefore domestication was necessary after the bulls reached three years of age. In this way, a strong and dangerous beast was made into a useful animal to serve his more intelligent master, man.

In early times the bulls were submitted to "plays," their opponents being

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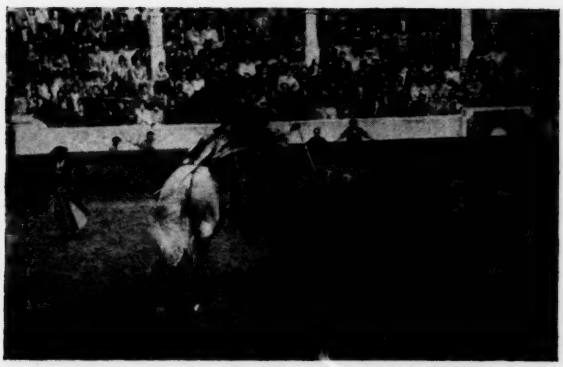

FIG. 1
The horseman in action.

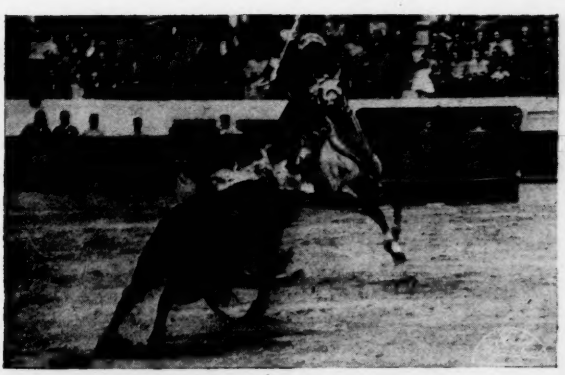

FIG. 2
The horseman in a difficult movement ("joād nuncio").

(*Article by Dr. José Caldeira Areias, page* 198)

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FIG. 3
Preparation ("pega de caras").

FIG. 4
Execution ("pega de caras").

(*Article by Dr. José Caldeira Arcias, page* 198)

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noblemen mounted on horses. In the neighbouring country of Spain men on foot "played" the bulls. In this way the two types of bull-fighting evolved. The two methods are carried out in the Portuguese bull-fight by the "knights" and "matadores."

Generally a bull-fight is composed of the "lide" of eight bulls challenged by two "knights" and two "matadores," with their respective "quadrilhas," or assistants, and a group of "forcados."

Before the start of the spectacle the bulls are submitted to a veterinary examination. Bulls that are in poor physical condition are rejected. The artists proceed to the "sorteio," i.e., the place where it is determined by ballot which bulls they will fight.

When all preliminaries are completed and spectators are seated in the amphitheatre, the band strikes up, the gates of the arena are opened and the artists with their "quadrilhas" pass through to begin the "defile," or parade. According to tradition, the "matadores" come first, followed by the "peoes de brega," or assistants, all in colourful costumes. Next come the "forcados," who catch the bull. Last in line are the "knights," with their long, attractively-coloured embroidered silk coats and tricornered hats. They ride stylish horses, in magnificent harness, around the arena and give an exhibition of horsemanship whilst greeting their patrons, the spectators.

When the parade is over a trumpet is sounded and the oldest "knight," or "calvaleiro," enters the arena, and then the first bull is admitted. After studying the actions of the bull for some time, the horseman begins the first "sorte," or movement. The bull is challenged to attack the horse. If the challenge succeeds the bull will charge the horse. The "knight" guides the horse out of the bull's path, and at the same time placing a "banderilha," or spear, in the skin of the point of the shoulder of the "enemy."

The "knight," or "cavaleiro tauromaquico," must be a good horseman and have a thorough understanding of the art of bull-fighting. For many years, I. Branco Nuncio and Simao da Veiga have been the most famous Portuguese "cavaleiros tauromaquicos," because of their skill and knowledge. They are greeted by the public with great applause.

The bull's horns are protected with a "coriaceous" covering to prevent injury to the horse. This allows the "knight" to take greater risks. When the bull charges he can leave it to the very last moment before turning his horse from the path of the beast. This evasive action is executed with superb grace and skill.

After this demonstration by the horseman the bull is kept in the arena for the "forcados" to catch the bull. Like the work of the "cavaleiro," this is a typical Portuguese bull-fight scene, and it is appreciated highly because the strength and courage of these young men is unexcelled in any other event. As a rule these men are noblemen who perform only through love of the art and pride of their race. They do not receive money.

The "pega," or act of catching the bull, may be executed in front ("de

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caras ") of the bull or on the side over the shoulders (" cernelha "). If in front the " forcado " challenges the bull at a distance, and when the beast charges he will attempt to hold the bull around the neck while laying between the horns. His assistants aid in the attempt to stop the charging bull by lining up behind the " forcado." In catching the bull over the shoulders the man runs along the side of the bull while an assistant holds firmly to the tail.

Salvacao Barreto in " pega de caras " and Rodes Sergio in " cernelha " are the most famous exponents of this phase of the bull-fight at the present time. Salvacao Barreto was invited to Italy where he caught the wild bull in the filming of the popular film, " Quo Vadis."

After the bull is played the " cabrestos," or domesticated bulls, enter the arena to entice the wild bull from the arena to the yards. The " campinos," i.e., men wearing green and red clothing characteristic of the costume worn by the guards of the wild bulls in the fields, guide the animals on their way out with the aid of long poles.

After the bull has left the arena, if the " lide " was a very good one the crowd will show its appreciation by applauding the artists, who will appear and go around the arena to accept the tribute.

The " lide " of the first bull is completed. At the sound of the trumpet the second " knight " appears, ready to start the " lide " of the second bull in the same manner as the first.

This second bull is followed by the Spanish style of bull-fighting, wherein the " matador " is on foot.

The bull which the " matador " plays has its horns uncovered, making the " lide " more exciting and allowing the artist to exhibit his skill and cleverness.

When the bull enters the arena, the " peoes," or assistants, attempt the first " passes," or movements, giving the " matador " the opportunity to study the attitudes and reactions of the animal before he begins the " lide." Having done so, the " matador " orders the " peoes " to retire, and in a solemn and audacious manner the " matador " advances to begin the " fight." The " lide " is divided into three parts, or " cercios " : first is working the " capote," or long cape, second consists in inserting " banderilhas," and the third is with the small, red cloth called " muleta."

The people await in silence the first movements of the artist with the " capote." The " matador " stands firmly, and invites the bull to charge by means of the long cape which he will use to direct the wild beast through a series of skilfully-executed " sortes," or manœuvres, of various types with proper names, such as the " Veronicas," finishing generally by " Meia Veronica." In this phase the artist invites his fellow to fight his bull with the "capote," and this "matador" will exhibit also such manœuvres as " Gaoneras," " Chicuelinas " (names in homage to Gaona and Chicuelo), and others.

The second " tercio " consists of placing two or three " banderilhas " in the shoulders of the bull to stimulate and make him brave.

In the last and more important " tercio " the " matador " holds the red cloth called " muleta " and the sword which he will use to simulate the kill to

end the "lide." The "matador" begins this phase by offering the "lide" to an important person or a personal friend in the amphitheatre. As a symbol of this the artist casts his hat, or "montera," to the selected personality. Then he advances to begin, alone, the most appreciated part of his work. Solemnly and courageously he challenges the bull to attack. Then, using the "muleta," the "matador" executes various "sortes" in order to mislead the bull, until he gains complete domination of it. "Naturais," "Manoletinas," "Arruzinas" (names in homage to Manolete and Arruza) are some of the various manœuvres executed as the crowd shouts its approval. Finally, when the animal is dominated completely, the public is rewarded by seeing the triumphant "matador" expose his unprotected body to the bull, who stands defeated. At this time the victor simulates the kill by putting a "banderilha" in its shoulders and retiring proudly to accept the congratulations of the crowd.

Manuel Dos Santos is the Portuguese "matador" who executes all manœuvres with the utmost art and knowledge. He is very much admired in this country as well as in others where he has been "fighting."

CLINICAL ARTICLE

A CASE OF MALIGNANT MELANOMA IN A BAY HORSE

By M. S. E. MOSTAFA, M.V.Sc.

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A GREAT deal has been written about melanomas in white horses but very little information exists about their occurrence in brown ones, but it is generally agreed that melanomas are relatively rare among coloured horses.

Case Report

The subject was a male, bay Arabic horse about 15 years old which was admitted to the Faculty of Veterinary Medicine because of weakness and loss of weight. Naked eye examination revealed a firm, smooth growth about the size of a man's fist occupying the upper and lateral side of the anus, and a number of dark brown nodules on both sides of the ventral surface of the tail. The abdomen was swollen and tender. The temperature was 38.5° C. Pulse and respiratory rates were slightly above normal. The condition was diagnosed as multiple melanomatosis, and it was decided to destroy the animal,

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but it was found dead next day. I had the opportunity of performing an autopsy and the following observations appear worth recording.

Post-mortem Findings

Abdominal cavity: Stomach, small intestine, large intestine and rectum were congested. Peritoneum and mesenteric lymph nodes showed metastatic growths. The spleen which weighed 15.7 kg. and measured 85 cm. in length by 48 cm. in width was very greatly enlarged. It contained many soft black nodules varying from 2 to 5 cm. in diameter. Splenic lymph nodes were swollen and on section showed melanotic deposits (Fig. 2).

Liver: Weight 7 kg., was enlarged, fatty, and showed numerous secondary growths from 1 to 1.5 cm. in diameter (Figs. 3 and 9).

Kidneys: Right kidney weight 510 gm., measured 15 x 14 x 11 cm. Left kidney weight 550 gm., measured 18 x 11 x 9.5 cm. Both contained soft black masses 0.5 to 1 cm. in diameter—(Figs. 3 and 8).

Pancreas: Showed similar metastatic growths.

Bladder: Empty; mucosa normal.

Testicles: There were pigmented deposits on the parietal surface of the tunica vaginalis communis.

Three deeply pigmented tumours (Fig. 1) were present in the abdominal cavity. The first (*a*) weighed 750 gm. and measured 20 x 12 x 10 cm. It extended from the ventral aspect of the second lumbar vertebra to the level of the shaft of the ilium, lying in the mid line and extending slightly to the left of it. The second (*b*) weighing 455 gm. and measuring 17 x 12 x 7 cm. extended caudally from the level of the shaft of the ilium to the root of the tail, and occupied the whole of the left part of the pelvic cavity. The third (*c*) weighed 195 gm. and measured 8 x 8 x 7 cm. It extended caudally from a point equidistant between the shaft of the right ilium and the cotyloid cavity to the lateral margin of the anal opening. It filled the dorsal part of the right pelvic cavity. All the three tumours with those on the ventral surface of the tail were firm, well defined and had thin fibrous capsules. When sectioned, they were dark brown, and left a slimy brown fluid on the knife.

The dopa reaction was not performed because dioxyphenylalanine was not available.

Thoracic cavity: Both lungs weighed 9.7 kg. and contained multiple growths about 0.5 to 1.5 cm. in diameter raised above the surface (Figs. 4 and 10). Mediastinal and bronchial lymph glands showed metastatic growths.

Heart and Pericardium: About 1 pint of clear fluid was removed from the pericardial sac. Secondary growths were seen in the pericardium. The heart weighed 4 kg. The myocardium was flabby but contained no metastases.

The diaphragm was studded with black deposits. The parietal pleura showed black pigment granules.

An incision was made through the muscles of the thigh and pigment deposits were seen between the muscle fibres. The femur was sectioned in the median plane and black pigment was seen in the bone marrow (Fig. 5).

Sections for microscopic examination taken from the tumours and from the organs containing secondary deposits were fixed in a 10 per cent formal saline. They were then embedded in paraffin, cut and stained with hæmatoxylin and eosin.

Histological examination : The tumour was richly cellular (Figs. 6 and 7). The amount of pigment in the cytoplasm varied. Some cells contained none, but some contained so much that the nucleus was hidden. There was a good deal of apparently free pigment between the cells. Some cells were round or oval, others were polyhedral or spindle shaped. They had relatively little finely granular acidophilic cytoplasm. The nuclei were large in relation to the cytoplasm and occupied an eccentric position. The nuclear chromatin was coarse and unevenly distributed. A few mitotic figures were observed but no giant cells as some writers describe. The cells which were spindle-shaped or polyhedral were usually arranged in sweeping bundles, while those which were round or oval tended to be grouped in masses in small or large alveolar patterns. Very few connective tissue fibres were noticed between the cells. Blood vessels were numerous and thin-walled.

Histogenesis

Melanin is the normal colouring matter of the skin and choroid coat of the eye. Its exact chemical nature is not known but it is believed to be formed by the melanoblasts situated in the basal layers of the epidermis from melanogenic protein (tyrosine) which is oxidised by the special oxidases of these cells to dioxyphenylalanine (dopa) and subsequently into melanin. Gessard (1902) detects the presence of tyrosine and tyrosinase in equine melanomas and concludes that the pigments of tumours are produced by the action of tyrosinase on tyrosin and other aromatic compounds. Bloch (1926) following the leads presented by Thurmahlen, Splencer and Quanttini finds that a solution of 3 : 4 dioxyphenylalanine when oxidised by a specific intracellular ferment (dopa oxidase) produces a brown pigment. Whether these melanoblasts are epidermal, mesodermal, ectodermal or neurogenic in origin is still undecided. Recklinghansen (1882) accepts by exclusion the endothelial origin. Post (1894) attributes pigment production in mammals almost exclusively to epithelium. He regards pigmented connective tissue cells as carrying excess pigment from epithelium. Ribbert (1897) and Jaeger (1909) and M'Fadyean (1933) claim that they are of mesoblastic origin. J. W. Dawson (1925) considers that the basal cells of the epidermis are the true pigment producers. Other authors favour a neurogenic origin. Masson (1926) believes that they are derived from tactile corpuscles and nerve cells forming the end-apparatus of the cutaneous nerves. E. K. Dawson (1939) accepts all three sources. Bloch shows that melanoblasts are intimately mingled with epithelial cells in the epidermis and that it is difficult to distinguish between melanoblasts and epithelium in normal skin, and specially difficult in pathological alteration in the Malpighian layer. Ewing (1940) believes that the evidence pointing to the epithelial origin of cutaneous melanomas is unsatisfactory and inconclusive. Willis (1948) divides melanomas

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according to their site of origin; those of the skin are derived from the basal cells of the epidermis, those of the eye from the pigmented epithelium of the retina and those of the leptomeninges from the nerve cells of the substantia nigra and dendritic cells of the meninges, and concludes that the belief that all melanomas are similar histologically and derived from a single specific kind of cell, the melanoblast, is mistaken.

Discussion

Melanomas are said to be uncommon in darkly pigmented horses in contrast to the frequency with which they occur in grey ones. Virchow (1859) views the frequency of the tumour in grey horses as an evidence of congenital dyscrasia but does not explain why this should occur particularly in the grey horse. He recognises both a sarcomatous and carcinomatous melanoma and employs the term melanoma for the entire group. Van Dorssen (1903) believes that melanomas are built up by pigmented cells present in the corium of the skin of grey horses and so horses other than grey fail to develop melanomas because they lack the cells from which melanomas take their origin. He suggests that in aged horses the demand for pigment is so much diminished that it accumulates in the cutis and following an upset in pigment metabolism the growth of the melanoma results. Jaeger (1909) in 63 autopsies on grey horses fails to discover pigmented nævi of the skin. Thomas (1929) calls these tumours basal cell melanotic epitheliomata. Feldman (1932) states that old grey and white horses are peculiarly prone to cutaneous melanomas which are apparently not preceded by benign moles comparable to human ones, which usually are derived from pre-existing moles (Afflick, 1936). M'Fadyean (1933) points out that melanomas are comparatively rare in horses other than grey, and describes two cases of what he calls melanotic carcinoma in two aged bay geldings in 1890. He mentions that in black, brown and bay horses the demand which arises from new melanin in the skin and hairs is subject to little variation throughout life, but in grey horses practically from birth onwards the demand for pigment begins to diminish and after middle life rapidly decreases owing to the increasing number of white hairs which no longer require melanin. This is suggested, as the reason for the frequency with which primary melanomas arise near the root of the tail in the grey horse. McClellard (1941) observed two cases of malignant melanomas in dogs, a breed in which the skin and aural mucosa are normally heavily pigmented. Magrulkab (1944) was able to collect five cases of melanomas out of 400 tumours examined, of which four were benign and one malignant. They are from one mare and four horses, all aged and grey in colour. He also found five cases of malignant melanomas in eight 12-year-old mules, one grey and four browns. In describing these tumours he mentions that cells occasionally assume, by fusion or independent nuclear division, the appearance of giant cells; a feature not seen in my case. Anderson (1948) states that melanomas are said to be uncommon in negroes, a phenomenon which has been considered analogous to the frequency of melanoma in white or grey horses in contrast to the incidence in darkly pigmented ones.

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B A C

FIG. 1
Shows three malignant melanomas (A, B and C) removed at autopsy from the abdominal cavity of a bay horse.

FIG. 2
Shows greatly enlarged spleen containing multiple rounded and irregular nodules of tumour.

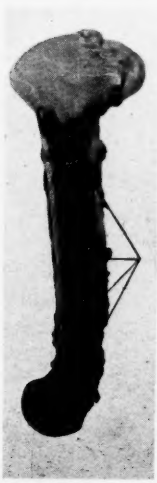

FIG. 5
Femur sectioned in the median plane showing black pigmentation of bone marrow.

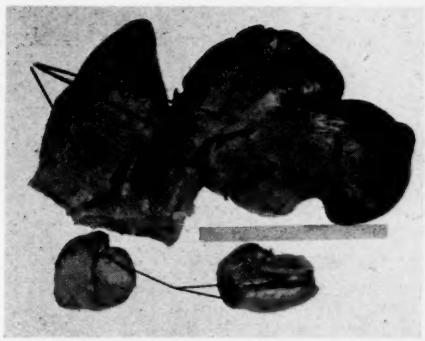

FIG. 3
Shows secondary melanomas in right and left kidneys, and liver. Lesions varying in size from 0.5 to 1.5 cm. in diameter.

FIG. 4
Right and left lungs showing multiple tumour deposits 0.5 to 1.5 cm. in diameter raised above the surface.

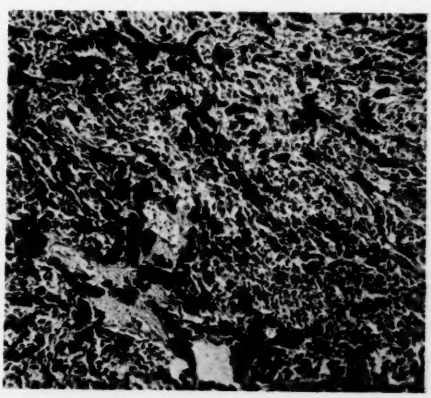

FIG. 6
Photomicrograph of primary tumour. Observe groups of heavily pigmented and unpigmented tumour cells. The tumour was removed from the upper and lateral side of the anus of a bay horse. Hæmatoxylin and eosin x 450.

(Article by Mostafa, page 201)

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PLATE II

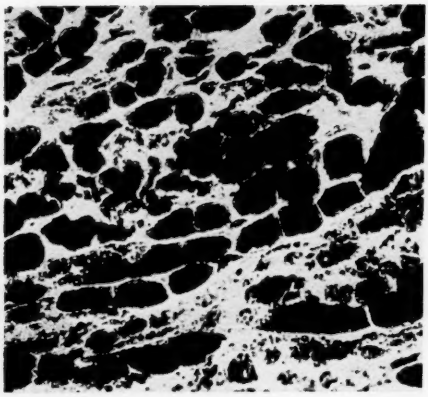

FIG. 7
Photomicrograph from secondary melanoma removed from the abdominal cavity. Note groups of heavily pigmented cells. Hæmatoxylin and eosin x 800.

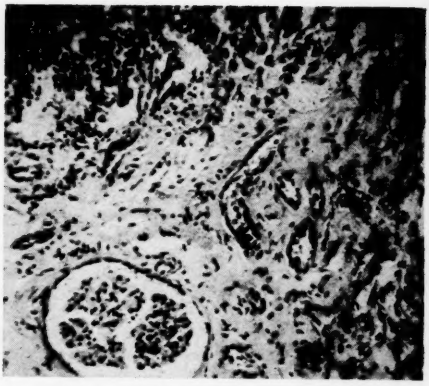

FIG. 8
Photomicrograph of metastatic melanoma of kidney. Observe tumour cells and melanin pigment inside and outside degenerated cells of tubules. Hæmatoxylin and eosin x 450.

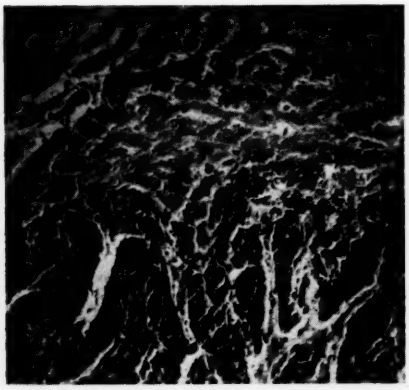

FIG. 9
Photomicrograph of secondary growth in liver showing heavily pigmented cells, necrosed liver tissue with melanin pigment in between liver columns. Hæmatoxylin and eosin x 450.

FIG. 10
Photomicrograph of the lung showing compressed and necrosed alveoli containing melanin pigment. Hæmatoxylin and eosin x 450.

(Article by Mostafa, page 201)

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Summary

A case of malignant melanoma in a bay horse is described with the pathological findings.

The histogenesis of melanomas is discussed, and the previous opinions on the ætiology of melanomas in horses briefly described.

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ABSTRACTS

ENZOOTIC STILL-BIRTHS IN PIGS IN JAPAN, by Sadakatsu Akiyama and others. *Journal of the Japanese V.M.A.*, November, 1952.

IN this paper the author gives a very interesting account of enzootic still-births occurring among pigs in the Nagano province of Japan. This disorder assumes at certain periods of the year very considerable proportions and is one of the major hazards of the pig-rearing industry. For example, out of a total of 247 sows which provided the material for the investigation, 189 at the first farrowing gave birth to a total of 1,634 piglets of which 1,282, or 78.5 per cent, were still-born while a further analysis of the figures shows that 147 sows did not give birth to a single live pig.

It appeared to the investigators that the incidence of still-births coincided with the advent of the hot weather and the appearance of mosquitoes. The season for the mosquitoes lasts from September to November and the disastrous first farrowings took place from September to December. On the other hand, the second farrowings, which took place between January and March—a time during which the mosquitoes were scarce—resulted in a decline of the still-births to 58.5 per cent. A graph constructed to show the inter-relationship between the still-births and the presence of mosquitoes shows a time lag of about

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two months between the peak of the mosquito invasion and the greatest total of still-births.

There is a great deal to connect the enzootic of still-births with the incidence of encephalitis both of pigs and of horses and the data collected shows that the peak period for this condition exactly coincides with the highest recorded total of still-births. This connection between encephalitis and the enzootic is further emphasised by bacteriological findings for 19 sows that had been infected showed that they possessed antibodies to the toxin of encephalitis. Careful examination failed to reveal the presence of any bacterial or protozoan causal organism nor were agglutinins to brucella or paratyphus demonstrated.

The clinical picture varies according to the age of the animal affected. In sows there is a sudden rise in temperature to 104 to 105.8 deg. F., a dry snout and the mouth is full of a foamy mucus; the eyelids are suffused with blood and there is some weakness in the hindquarters. It is not a fatal condition.

In young animals, however, the number of casualties is high and in these cases the rise in temperature is accompanied by convulsions of the limbs and face and by paralysis.

Post-mortem on the still-born piglets reveals atrophy of the brain substance and abnormalities of the digits.

R.H.A.M.

NUTRITION ABSTRACTS AND REVIEWS. Vol. 22, No. 2, October, 1952. Aberdeen: Published by the Commonwealth Bureau of Animal Nutrition. Rowett Research Institute, Bucksburn, Aberdeenshire. Price 27s. ($4.0). Subscription to this volume, 45s., post free.

LIKE previous issues, this number contains a wealth of information about the divers' aspects of nutrition. Mention is to be made in particular of what is called a review article on " Meal Habits and Their Effects on Performance," by R. C. Hutchinson, which is an adequate review on the subject. Space does not permit us to give a fully summary of this article, interesting but of little value to the veterinarians. Suffice it to say that the author advocates " a daily regimen of six meals which would prevent the unfavourable effects of long intervals between meals and of the consumption of large meals."

J.K.G.

ESTUDOS SOBRE A BIOQUIMICA DO SANGUE EM CAES NORMAIS (Study on the Biochemistry of the Blood of Normal Adult Dogs), by Russo, Egydio, and Cristóvao Colombo de Souza. *Veterinaria* (Sao Paulo), 6(1): 13-21, Janiero a Março, 1952.

IN this communication the authors purport to study the chemical composition of the blood of dogs. Blood samples of 40 adult subjects have been examined with a photo-electric colorimetre, " Lumetron, mod. 400." The result is as follows:—

	Average	*Range*
Glucose	0.91 g.	0.60 —1.47 g.
Urea	0.32 g.	0.18 —0.60 g.
Creatine	0.017 g.	0.113—0.226 g.
Calcium	0.14 g.	0.11 —0.22 g.
Inorganic phosphorous ...	0.044 g.	0.032—0.067 g.

Unfortunately, authors' examination is limited only to a few constituents. A short bibliography is appended.

J.K.G.

RICHERCHE SULL'AZIONE IPOTENSIVA DEGLI ESTRATTI LIMFOGHIANDOLARI E SULLA LINFOGANGLINA (Study on the Hypotensive Action of the Extracts of the Lymphoid Tissue), by Faustini, Remo. *Archives Internationales de Pharmacodynamie et de Therapie,* Vol. LXXXVI, Fasc. 1, ppl-15, 1951.

FAUSTINI has recorded, in the present paper, the presence of a hypotensive factor in the alcohol and acetone extracts of fresh bovine lymphoid tissues which he believes to be histamine. However, the existence of the specific hypotensive substance (lymphogangline) antagonistic to adrenaline, first put forward by Marfori in 1916, has not been confirmed by the author.

REVIEWS

INCUBATION AND HATCHERY PRACTICE, Bulletin No. 148, Ministry of Agriculture and Fisheries, by Dr. W. M. Allcroft. H.M.S.O. (1952). Price 3s. net.

IN a foreword to this extremely useful monograph, Mr. R. Coles says: "Whatever the cause probably more than 30 per cent of all the eggs used for incubating fail to produce a chick . . . the 30 per cent loss must represent a heavy charge on the poultry industry of the country." Dr. Allcroft's book aims at reducing this very heavy loss.

The first half of the monograph begins with a description of matters relating to the structure of the egg and to embryology before discussing the selection and handling of eggs for hatching. Then, from a very practical point of view it considers the requirements for efficient incubation, deals briefly with natural hatching, and ends with a much more extensive review of artificial incubation.

In the latter half of the book hatchery design and construction and various aspects of management and hygiene are described at length. Not the least useful part of the monograph is a "trouble-tracing chart" designed to help the practical poultry breeder to locate the cause of his difficulties and to remedy them.

A second appendix deals briefly with the special problems of the hatching of turkey, duck and goose, as distinct from hen, eggs.

The monograph concludes with a short bibliography. Although it is clearly

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designed for the practical poultry man, the book does not omit to refer to fundamental matters wherever it is necessary. It can be recommended.

THE NATURE OF VIRUSES AND BACTERIA, by Professor G. M. Boshyan. Published by Medgeez, Moscow.

SINCE its first publication in 1942, the Boshyan theory has exerted a far-reaching influence on Russian bacteriology and biochemistry and the author, the recipient of many decorations, has taken his place with the botanist Michurin and the geneticist Lysenko as one of the founders of Soviet science. The book in which this theory is set out is worthy of the attention of the bacteriologist and of the veterinary surgeon and most of the experimental work upon which the theory is based was done with those viruses which commonly attack animals.

Taking up his standpoint on the hypothesis that the form of living cells is deeply affected by environmental conditions and basing his observations to a large extent on his work with infectious equine anæmia, Professor Boshyan proceeds to put forward a number of propositions which he considers valid for all viruses. The first of these hypotheses is that the formation of living cells is brought about by the crystallisation of protein and that these crystals, depending on the conditions, give rise to the formation of viruses which are the smallest living particles: these in turn may undergo further development and become bacteria. This metamorphosis of the virus into higher and larger living bodies is heralded by the appearance of a Gram negative detritus and Gram negative and Gram positive granules may emerge from this detritus. The granules change into cocci which undergo a variety of modifications but they always tend to become larger and finally become stabilised as rods or as bipolar organisms. The nature of the metamorphosis and the final appearance of the bacteria depend on the surrounding conditions which exert a determining influence over the whole process. It follows therefore that life is continually emerging from inert substances and this point is stressed as of great importance.

The second hypothesis suggests that this process of metamorphosis is reversible and that bacteria may revert to their virus and crystalline forms. This reversion is said to take place in a hostile environment; the crystals are resistant to certain physical, thermal and chemical action and therefore the reverse metamorphosis must be regarded as a defensive reaction of the bacteria with a view to the preservation of the species.

Arguing from these two propositions and guided by the results of his experiments, the author draws a number of conclusions and suggests that metamorphosis and reverse-metamorphosis are not confined to the filterable viruses. Bacteria such as *Pfeiferella mallei, Brucella abortus* and the tubercle bacillus may revert to filterable and crystalline forms and change back to bacteria when an amelioration of the surrounding conditions makes such changes possible. It is inferred that heat and disinfectants may cause the disappearance of bacteria from various substances but do not kill them; they have taken on a protective ultra-visible form and are combined with the reagents used. It follows that no

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sera and no allergic reagent can be considered as dead and it is claimed that *Pfeiferella mallei* and the tubercle bacillus have been obtained from mallein and tuberculin.

These theories are applied to the phenomenon of immunity, and antibodies are said to be altered blood protein in combination with the filterable form of the antigen. Immune sera are the cause of the metamorphosis of bacteria to inert filterable forms and these are incapable of causing disease.

These are some of the main points of the Boshyan theory and it is of interest: but it is not put forward as a speculation but as fact. The enunciation of new scientific theories must be accompanied by such an account of the experimental work on which they are based as to allow other investigators to repeat the experiments and form opinions of the validity of the theories, and in this respect Professor Boshyan's book is exceptionally weak: and the experimental data which led to the formulation of his hypotheses are not given in that detail which overcomes hesitation and compels belief. It would be difficult, from the information contained in this book, to make experiments designed to test a number of the assertions. It is not enough to state that filterable viruses may be grown artifically and to refer in passing and in parenthesis to meat-peptone broth or Tarozzi's or Martin's media: this is a typical example of the looseness of the writing. Crystalline forms of the viruses of animal diseases may possibly be obtainable at some future time, especially as some of the viruses of the disease of plants have been observed in this state. There is, however, a natural curiosity to know how this form of, say, the foot-and-mouth disease virus, or of the tubercle bacillus were in fact obtained by the research in question. The illustrations of crystals and the statements that they are the crystalline forms of certain viruses and bacilli are not a substitute for a clear account of laboratory technique. To refer to special methods and to give no indication of what these methods are, is to give rise to doubt. This unfortunate presentation does not in itself invalidate the possible correctness of many of the propositions although it is doubtful if many of the arguments are capable of standing close scrutiny. The book may perhaps be a stimulus to further research.

PRINCESS TANKARD: THE SILVER HORSE, AND OTHER STORIES, by Jean Wadland. Ilfracombe: Arthur H. Stockwell, Ltd., Elms Court, Torrs Park. Price 2s. net.

SOME books are entertaining, some are informative, others seek to convey a moral. There are three so-called stories in this book and one can read the lot in ten minutes. It is the job of a reviewer to give some idea of the contents of a book, to appraise its value to a potential purchaser and in doing so he may discuss its technical quality, its entertainment value, the message it contains, its literary standard or even its moral tone.

My report on this small tome is a negative one on all five counts, for the simple reason that although I have studied it for over 30 minutes, i.e., I have

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read through its jumble of words three times, I have not the least idea what it is all about. The publishers intimate that the author is a qualified veterinary surgeon.

BLACKS' VETERINARY DICTIONARY: THIRD EDITION, by W. C. Miller and Geoffrey West. London: A. & C. Black, Ltd., W.1. Price 50s. net.

THIS well-known book of reference has been completely revised and much new material has been added. This has been necessary for there have been many new discoveries in the realms of veterinary medicine and surgery since 1935. It would be difficult to think of any topic of veterinary interest which does not come under some review. The book should be very useful to all those owners of animals, be they of the farm, the commercial stable or the hearth, who desire to add to their knowledge of animal health and disease. The book will be in greatest demand amongst lay people and the greatest criticism one can make is that the authors presume that these readers are well versed on the principals of the basic subjects on which veterinary science is founded, for much of the material is given with great technical detail.

This may be a fault as regards the majority of the laity but it has its compensation in that the busy veterinary surgeon and the student can refer to its pages with confidence in any emergency. The illustrations, more than 300, add to the value of the book. The task of compiling such a book is a tremendous one and would dismay many and the authors should be congratulated on the result of their efforts.

LIVESTOCK HEALTH ENCYCLOPEDIA, by Rudolph Seiden. New York: Springer Publishing Co. Inc. Price $8.82 net; and London: Lange, Maxwell & Springer, Ltd. Price 63s. 9d. net.

WHEN 314 experts are gathered together in order to set down their newest findings and their practical recommendations for guarding and improving the health and value of livestock one might expect that the result would be a great mass of contradictory information which would in all probability confound the reader and so defeat the laudable intentions of the 314 well-intentioned men. Now these men have been responsible for 3,700 entries in this book and strange to say none of the above forebodings have come to pass, indeed the manual is remarkable for its clarity, and its mastery of essential facts. Rudolph Seiden has conducted his orchestra with great skill in execution, balance and tone. The information as set out in alphabetical order cross indexing adds to its value and it would be difficult to discover any single facet or feature of that cosmopolitan subject which goes by the name of Animal Husbandry which does not receive mention. The book is profusely illustrated, and this adds much to its value.

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It should be useful to owners of stock who have not the time or facility to peruse the scientific text books and periodicals and yet would like to be informed on the basic facts concerning animals in health and disease.

FLEMING: DISCOVERER OF PENICILLIN, by L. J. Ludovici. London: Andrew Dakers. Price 15s. net.

SCOTLAND is famed for her experts and the greatest of these are men who like Fleming have gone out into the world and by their deeds gained great distinction and brought renown to their native land.

Fleming came of Ayrshire farming stock, the youngest of a family of eight. Scottish farmers are the best in the world, for they are industrious, independent, and give great thought to their job. Such a fortunate environment had much to do with Fleming's success in his scientific career and there is no doubt that his great interest in the natural history of the Ayrshire countryside moulded his mind so that he could see and appreciate what others would miss.

He went to the small moorland school, a single room, with a dozen or so other boys and girls and here " He was taught to read, write, spell and count." Next he went to the larger school at Darvel, and finally to Kilmarnock Academy.

When he was 14 he joined his brother, Thomas, in London. Thomas was a medical man and practised as an occulist in Marylebone.

He attended the Regent Street Polytechnic, but left at the age of 16 to take up a clerkship in a shipping office. He joined the London Scottish and represented his regiment at Bisley, winning several prizes. When he was twenty years old he was left a small legacy. His brother advised him to use it in order to qualify in medicine. He chose to go to St. Mary's Hospital, for he had played against St. Mary's at water polo.

Thus as if by chance a choice was made which was to lead him to Sir Almorth Wright's laboratory. Fleming qualified on August 6, 1906, and joined Wright's staff the next day. Wright was at the height of his fame, for those were the golden days of bactercology, and there can be no doubt that he had the great aptitude of being able to choose his assistants wisely and to make them his devoted disciples. Fleming had good hands and he was an acute observer. This book gives a lucid and interesting account of life in the laboratory at St. Mary's, and of Fleming's persistent search for an antiseptic which would not damage tissues. It tells of his discoveries of Lysozyme and Penicillin, and of the patience and persistence with which he conducted the investigations as to the latter's potential therapeutic value. The delay in the full development of penicillin must have been a sore test to his pateince.

Fortunately Florey and his co-workers took up the task and by the end of World War II all Fleming's original work and hopes were justified by the production in fair quantity of the most wonderful chemotherapetuic remedy yet known to man.

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Penicillin has made many people famous, but the greatest fame of all will go always to the modest, observant and hardworking scientist at St. Mary's, "who had eyes to see what others missed."

This book should be on every young scientist's bookshelf. It will tell him that there is no royal road to success and fame; that success is dependent upon hard work, competent craftsmanship, and an acute power of observation. It will tell him also that modesty is a trait worth cultivating.

HARRY STEEL-BODGER MEMORIAL FUND

THE response to the appeal on behalf of the above fund has been magnificent and H.S.-B.'s friends have ensured that his great work on behalf of the profession and agriculture shall be kept in permanent record. The amount subscribed to date (April 23, 1953) is the handsome sum of £3,280 10s. 4d.

The subscription lists have now closed but in the case of organisations and societies who have not yet held meetings, arrangements have been made to accept further contributions. A final list of contributions will be published in the *Veterinary Record* on May 9.

NOTICES

A NEW BAYER PRODUCT

BAYER PRODUCTS, LTD., announce the introduction of "Seavac," their new Swine Erysipelas Vaccine, from March 6.

A single injection of 2 c.c. "Seavac" will normally suffice to give immunity. The use of this vaccine accordingly represents a big advance on the previous method of immunisation, i.e., the simultaneous inoculation with serum and live cultures.

"Seavac" is issued in bottles of 10 c.c. and 20 c.c.

Publishers' Notices

THE BRITISH VETERINARY JOURNAL, with which is incorporated THE VETERINARY JOURNAL, is published monthly, and copy for advertisements should be in the hands of the advertisement manager not later than the 20th of the preceding month, if proof is required. Tel.: Temple Bar 3386.

Letters for the Journal, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editor.

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